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HASSAN MAHINI
INVENTOR

EVENT LIST MENU FOR ACCESSING MENU ITEMS IN A HIERARCHICAL MENU

COATS & BENNETT, P.L.L.C.
P.O. Box 5
Raleigh, NC 27602
(919) 854-1844

5   EVENT LIST MENU FOR ACCESSING MENU ITEMS

IN A HIERARCHICAL MENU

FIELD OF THE INVENITON

The present invention relates generally to wireless communication devices and,

10   more particularly, to user interfaces for wireless communication devices.

BACKGROUND OF THE INVENTION

Wireless communication devices, such as cellular telephones, have been used in

the past primarily for voice communications. The advent of third generation (3G)

15   technologies has led to an expansion of wireless services available to consumers.

Some of the services now available for wireless subscribers include email, paging, web

browsing, and a variety of messaging applications, including SMS messaging and MMS

messaging.

The number of user features available in cellular phones is also increasing at a

20   dramatic rate. For example, many cellular phones now include a global positioning

system (GPS) receiver for determining the location of the cellular phone, and a Bluetooth

module to enable the cellular phone to communicate with nearby devices. Cellular

phones are also being combined with other devices, such as cameras, audio players,

and personal digital assistants (PDAs).

25   The plethora of services and features now available in cellular phones creates

design challenges for cellular phone manufacturers. One challenge is designing a user

interface that allows users to easily access services and features available in their

cellular phone. Another challenge is to design a phone which is compact, lightweight,

and has a long battery life.

5   It is neither practical, nor necessarily desirable, to provide buttons for every

application available in a cellular telephone. Increasing the number of buttons results in

a corresponding increase in the size and weight of the telephone. Additionally, a

telephone with too many buttons intimidates many people who are uncomfortable with

modern technology. Further, despite the number of services and applications available,

10 many people will still use their phones only for voice services. Cellular phones cluttered

with buttons would not appeal to those users who use their phone primarily for voice

communications.

   One way to provide access to numerous services and applications without

cluttering the cellular phone with buttons is to provide a system of menus that can be

15 presented to the user on a display, and a simple method of navigating through the

menus and selecting commands, settings, or options. The menu system may be text

based, e.g., a listing of features or options, or may be graphical, e.g., a group of icons or

a combination of text and graphics. In either case, the user typically navigates through

the menu system by selecting items in sequentially-presented menus until the user

20 reaches the desired command, setting, or function. Many applications of interest to the

user will reside in a menu several levels below the top level menu. The user must,

therefore, remember the sequence of selections that will lead to the desired function. In

a cellular phone with a large number of features or functions, the user may have difficulty

remembering the precise sequence of selections needed to access the desired function.

25 Even if the user is able to remember the sequence of selections, navigating through the

menu system can be tedious and time consuming.

   Therefore, there continues to be a need for improvements in user interfaces for

wireless communication devices that allows users to easily and quickly access desired

features or functions of the wireless communication device.

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5   SUMMARY OF THE DRAWINGS

The present invention relates to user interfaces for mobile communication

devices that allow users to quickly and easily access menus associated with desired

functions or features of the mobile communication device. The mobile communication

device maintains an event list that lists events requiring some user action. The events

10   may be initiated by a user, such as by setting an alarm, or may be an occurrence outside

the control of the user, such as receipt of a message by the mobile communication

device. Events may also be initiated by applications residing in the mobile

communication device.

The mobile communication device dynamically updates the event list responsive

15   to designated events and displays the event list responsive to user input. In one

embodiment of the invention, the user may display the event list by pressing a shortcut

key or a combination of keys, or any other access methods. Each event in the event list

is associated with a menu item in a hierarchical menu. The associated menu item is

invoked when the user selects an event from the event list. The menu item that is

20   invoked may, for example, display another menu or may execute an action associated

with the menu item. Thus, the event list provides a simple and consistent method of

accessing menus associated with different functions or features of the mobile

communication device without having to remember where those menus are located in

the hierarchical menu structure.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an exemplary mobile communication device

according to the present invention.

FIG. 2 is an elevational view of an exemplary mobile communication device as

30   seen from the front.

5   FIG. 3 is a drawing showing event icons that may appear on the display of the

mobile communication device.

FIGS. 4A – 4D illustrate an events menu according to the present invention for

accessing menu items in a hierarchical menu.

FIG. 5 is a flow diagram illustrating a procedure for adding events to an event list.

10   FIG. 6 is a flow diagram illustrating a procedure for deleting events from an event

list.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 is a block diagram of an exemplary mobile communication device 10

15   according to the present invention. The exemplary embodiment comprises a cellular

telephone. The present invention is not, however, limited to a cellular telephone and

may be embodied in other mobile communication devices, such as a personal digital

assistant (PDA).

Mobile communication device 10 comprises microprocessor 12, memory 14,

20   input/output circuit 16, audio processing circuit 18, transceiver 20, antenna 22, and user

interface 30. Microprocessor 12 controls the operation of mobile communication device

10 according to programs stored in memory 14. The control functions may be

implemented in a single microprocessor 12 or in multiple microprocessors. Suitable

microprocessors may include, for example, both general purpose and special purpose

25   microprocessors and digital signal processors. Memory 14 represents the entire

hierarchy of memory in a mobile communication device 10, and may include both

random access memory (RAM) and read-only memory (ROM). Computer program

instructions and data required for operation are stored in non-volatile memory, such as

EPROM, EEPROM, and/or flash memory, which may be implemented as discrete

30   devices, stacked devices, or integrated with microprocessor 12. I/O circuits 16 interface

5   the microprocessor 12 with audio processing circuit 18, transceiver 20, and user

interface 30. Microprocessor 12, audio processing circuits 18, and input/output circuit 16

may be incorporated into a specially designed application-specific integrated circuit

(ASIC) 26.

User interface 30 includes an input device 32, display 34, microphone 36, and

10   speaker 38. Input device 32 and display 34, disposed on the front face of the mobile

communication device 10 (Fig. 2), enable the user to interact with the mobile

communication device 10. Input device 32 may, for example, comprise an alphanumeric

keypad 40 and, optionally, a navigation control, such as joystick control 42 with push-

button functionality as shown in Fig. 2. Keypad 40 and joystick control 42 allow the

15   operator to dial numbers, enter commands, navigate menus presented on the display

34, and make selections. Display 34 allows the user to see dialed numbers, status

information, prompts, menus, and other information. Display 34 also allows the user to

view and read messages and to view images and graphics.

Microphone 36 converts the user's speech into electrical audio signals for

20   transmission by the transceiver 20, and speaker 38 converts audio signals received by

the transceiver 20 into audible signals that can be heard by the user. Audio processing

circuit 18 provides basic analog output signals to speaker 38 and accepts analog audio

inputs from microphone 36.

Transceiver 20 is coupled to antenna 22 for receiving and transmitting signals.

25   Transceiver 20 is a fully functional cellular radio transceiver, which may operate

according to any known standard, including the standards known generally as the Global

System for Mobile Communications (GSM), TIA/EIA-136, cdmaOne, cdma2000, UMTS,

and Wideband CDMA.

The mobile communication device 10 may also include a short-range wireless

30   interface 24 to connect the mobile communication device 10 with nearby devices. For

5   example, the mobile communication device may include a Bluetooth interface and/or an infrared interface. Bluetooth is a wireless technology that makes it possible to connect mobile communication devices 10 with other Bluetooth-enabled devices, such as a PC, printer, or another mobile communication device 10.

        The mobile communication device 10 according to the present invention may

10   provide a variety of services in addition to conventional voice communication services. The additional services may include, for example, text messaging using short messaging services (SMS), multimedia messaging using multimedia messaging services (MMS), and internet services such as email and web browsing using the wireless application protocol (WAP). The mobile communication device 10 may also include applications or

15   user features such as a calendar, organizer, and alarm. In a preferred embodiment of the invention, the applications included with the mobile communication device 10 include a call manager 50, a messaging application 52, an email application 54, and internet application 56. Each application may be stored in memory 14, as shown in Fig. 1. The call manager 50 maintains a list of contacts with addresses and phone numbers and

20   handles incoming and outgoing voice calls. One function performed by the call manager 50 is to maintain call lists, which may include a list of recent calls and a list of missed calls. The messaging application 52 provides SMS and MMS messaging services. Incoming SMS and MMS messages are stored in an inbox until read or viewed by the user. After reading or viewing, the messages are deleted from the inbox. The email

25   application 54 allows the user to send and receive emails. The email application 54 may also include an inbox to store unread messages. The internet application 56 includes a web browser that allows the user to browse web pages. The internet application 56 also allows the user to send and receive WAP messages.

        During use, the various applications being run by the microprocessor 12 may

30   cause icons to be displayed on the display 34 to provide notices or alerts to the user, as

5   well as to provide status information. Fig. 2 illustrates a few exemplary icons as they

would appear to a user during use of the mobile communication device 10. In the

example illustrated in Fig. 2, the mobile communication device 10 is displaying the time,

denoted by reference numeral 60, at the bottom of the display 34. A battery icon 62 is

displayed to the right of the time 60 to indicate the remaining battery life. To the left of

10   the time 60 is an alarm icon 64 and signal strength icon 66. The alarm icon 64 indicates

that an alarm 64 has been set and is active. The signal strength icon 66 indicates the

current signal strength as seen by the mobile communication device 10. At the top of

the display 34 are three icons, which are respectively a voice mail icon 70, a WAP

message icon 72, and a Bluetooth icon 74, associated with events that require some

15   user action. The voice mail icon 70 indicates the user has received a voice message

that has not been previously accessed by the user. The WAP message icon 72 likewise

indicates that the user has received an unaccessed WAP push message. The Bluetooth

icon 74 indicates that the Bluetooth interface is enabled and active. Some additional

icons that may appear on the display are shown in Fig. 3. The icons shown in Fig. 3 are

20   associated with events that require user action

Although the display 34 provides a convenient method to notify the user of

events or to display status information, it may still not be readily apparent to many users

what action needs to be taken to respond to a notification or to change a current status.

Conventionally, access to services or features of the mobile communication device 10 is

25   obtained via hierarchical menus displayed to the user on display 34. Table 1 below is a

partial listing of menu items that may appear in a typical hierarchical menu for a mobile

terminal.

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Table 1: Menu

Top Level	2nd Level	3rd Level
Messages		
	SMS	
		Write new
		Inbox
		Unsent
		Sent items
		Options
	MMS	
		Write new
		Inbox
		Unsent
		Sent items
		Options
	E-mail	
		Send & Receive
		Inbox
		Write new
		Outbox
	Push inbox	
		Inbox
		Clear push inbox
		Push access
Calls		
	Missed Calls	
	Call List	
	Manage Calls	
		Forward Calls
		Accept Calls
		Call Waiting
Web Services		
	in Mode Line	
	Bookmarks	
		Add bookmark
		BM1
		BM2
		BM3
	Push inbox	

5 **Table 1 (cont.)**

Top Level	2nd Level	3rd Level
Organizer		
	Calendar	
	Notes	
	Alarms	
		Alarm
		Recurrent Alarm
	Timer	
Connect		
	Infrared port	
	Bluetooth	

The user may use the joystick 42 or keypad 40 to navigate through a series of
menus to access messages or other services, change or view settings, and enable or
10 disable functions. Hierarchical menus are well known in the art and commonly used
because menus do not take up space and can be easily implemented in small devices.
The number of functions that can be accessed via menus is limited only by available
memory. While display menus can accommodate a large number of features or
functions in a mobile communication device 10, the complexity of display menus gets
15 more complex with each added feature or function.

Many users have difficulty navigating through complex menu structures to access
services, functions or features, particularly when the function is one that is seldom used.
In the above example, if the user decided to disable the Bluetooth interface, the user
would have to navigate through the menus to find the command to disable the Bluetooth
20 menu item, which may reside in a menu several levels below the top-level menu. Even if
the user is able to remember the sequence of steps to get to the Bluetooth menu item,
navigation through the menus may still be tedious.

The present invention provides a method of accessing services and features of a
mobile communication device 10. According to the present invention, the
25 microprocessor 12 maintains a list of all active events that is dynamically updated as

5   new events occur and stores the updated event list 58 in memory 14. An event may be

initiated by the user, such as when the user enables the Bluetooth interface or sets an

alarm. Events may also be initiated by the network, such as when the user receives a

call, or by an application in the mobile communication device 12. When an event

occurs, the microprocessor 12 updates the event list 58, which serves as a customized

10   menu for quickly accessing services or features of the mobile communication device 10.

The event list 58 comprises a collection of pointers to the locations of menu items

corresponding to the events in the event list 58. For example, if the user misses a call,

the microprocessor 12 may place a pointer to a Missed Calls menu item in the event list

58. As another example, if the user enables the Bluetooth interface, the microprocessor

15   12 may place a pointer in the event list 58 that points to a menu item for disabling the

Bluetooth interface.

The user interface 30 preferably includes a shortcut key that allows the user to

quickly access and display the event list 58 from a standby mode. The shortcut key may

comprise a press of a single key or a combination of keys. The shortcut key or key

20   sequence is referred to hereinafter as the Event List shortcut. Once the event list 58 is

displayed, the user can simply select a desired action from the event list 58 regardless of

the type of event. Selecting an event from the event list invokes a menu item in the

hierarchical menu. The menu item invoked may cause a menu to be displayed on the

screen, or may execute some action or function associated with that menu item. Thus,

25   the event list 58 provides a simple and consistent method of accessing widely disparate

features of the mobile communication device 10. The following examples are provided

to illustrate some of the uses of the present invention.

Example 1.

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5   The user has missed a voice call. A missed call icon (the first icon in Fig. 3) is

displayed on the display 34 to notify the user of the missed call. The user activates the

Event List shortcut to display the event list 58 on the display 34. The event list 58,

shown in Fig. 4A, includes a pointer to a Missed Calls menu item. When the user

selects "Missed Call" from the event list 58, the user is taken directly to a list of missed

10   calls. The Missed Calls pointer will remain in the event list 58 until the user has

responded to or deleted all of the missed calls in the Missed Calls list. When the user

responds to the last missed call, the microprocessor 12 removes the Missed Call pointer

from the event list 58.

15   Example 2.

The user has a missed voice call and a missed MMS message pending. A

Missed Call icon and MMS Message icon are displayed on the display 34. When the

user activates the Event List shortcut, the event list 58 shown in Fig. 4B is displayed.

The event list 58 now contains two pointers, one to an MMS message inbox and one to

20   a Missed Call list. The user can select either "MMS Messages" menu item or "Missed

Calls" menu item from the event list 58. If the user selects the "Missed Calls" menu item

from the event list 58, the user is taken directly to a Missed Calls list as previously

described. If the user selects the "MMS Messages" menu item, the user is taken to a

MMS message inbox where the user can view all unread MMS messages. The MMS

25   Message pointer will remain in the event list 58 until the user has viewed or deleted all of

the unread MMS messages. When the last unread MMS message is viewed, the

microprocessor 12 removes the MMS Message pointer from the event list 58.

Example 3

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5   In addition to the missed call and unread MMS referred to in Example 2, the user

has an unread SMS message, has set an alarm, has enabled the Bluetooth interface,

and has an unread email message. Corresponding icons are displayed on the display

34. When the user activates the Event List shortcut, the event list 58 shown in Fig. 4C is

displayed. The event list 58 now contains six pointers corresponding to six different

10   events. Each pointer serves as a shortcut to a menu item in the hierarchical menu

structure allowing the user to directly access services or features without having to

remember where the corresponding menu items are located. If the user wants to check

his or her SMS messages, the user can select the "SMS Messages" item from the event

list 58, which is really a pointer to the user's SMS inbox. Selection of the "SMS

15   Message" item will therefore take the user directly to the SMS inbox. After the user has

read all previously unread SMS messages, the microprocessor 12 removes the "SMS

Message" item from the event list 58. The event list 58 will then include five items as

shown in Fig 4D.

In the above examples, the items in the event list 58 are ordered based on the

20   time of the events with the most recent event first. A different order could be used. For

example, the user could assign priority levels to different events, which would be

displayed in order of priority. In some embodiments, the user may be able to specify

events to include or exclude from the event list 58. Ordering could also be based on

frequency of use. The microprocessor 12 could maintain statistics reflecting the

25   frequency of use of different features and order items in the event list 58 based on the

usage statistics.

Fig. 5 illustrates an update procedure 100 that may be executed by the

microprocessor 12 for updating the event list 58 responsive to new events. The update

procedure 100 begins when an event is detected (block 102). The events that trigger

30   the procedure may be determined by programs installed by the manufacturer or, in some

5   embodiments, may be specified by the user. In this case, it is assumed that the events

are preprogrammed by the manufacturer and that the user has the ability to exclude

preprogrammed events from the event list 58. In this scenario, microprocessor 12

initially checks whether the event is one that has been excluded by the user from the

event list 58 (block 104). If so, the procedure ends (block 112) without updating the

10   event list 58. If the event has not been excluded, the microprocessor 12 checks whether

the event is already included in the event list 58 (block 106). In a preferred embodiment

of the invention, a single item in the event list 58 appears whether there is a single

occurrence of the event or multiple occurrences of the same type of event. For example,

if the user receives an SMS message when unread SMS messages already exist in the

15   SMS inbox, the "SMS Message" icon will already appear in the event list 58. In this

case, the event list 58 is not updated and the procedure ends (block 112) without

updating the event list 58. If the event is a type that has not previously occurred and is

not already represented in the event list 58, the microprocessor 12 adds the new event

to the event list 58 (block 108) and sorts the list (block 110) according to any desired

20   sorting algorithm. After updating the event list 58 (blocks 108 and 110), the procedure

ends (block 112).

Fig. 6 illustrates an exemplary procedure 150 for deleting events from the event

list 58. The procedure shown in Fig. 6 may be included within or called by another

procedure. The exemplary procedure 150 shown in Fig. 6 is executed when a user exits

25   from an SMS inbox (block 152) maintained in the mobile communication device 10 and

may therefore be included as part of other SMS program codes. When the user exits

from the SMS inbox, the microprocessor 12 determines the number of unread SMS

messages (block 154). If the number of unread messages in the SMS inbox is greater

than 0, the microprocessor 12 does not take any action and the procedure ends (block

30   160). If, however, the number of unread SMS messages in the SMS inbox is equal to 0,

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5   the microprocessor 12 checks whether the "SMS Message" event is in the event list 58.

If not, microprocessor 12 does not take any action and the procedure ends (block 160).

However, if the "SMS Message" event is in the event list 58 and the number of unread

messages is equal to 0, the microprocessor removes or deletes the "SMS Message"

event from the event list 58 (block 158) and the procedure ends (block 160).

10   Fig. 6 illustrates one exemplary procedure that may be included in SMS

applications. Procedures similar to that shown in Fig. 6 may also be provided for

handling other forms of messages, such as voice calls, email messages, MMS

messages.

        The present invention may, of course, be carried out in other specific ways than

15   those herein set forth without departing from the spirit and essential characteristics of the

invention. The present embodiments are, therefore, to be considered in all respects as

illustrative and not restrictive, and all changes coming within the meaning and

equivalency range of the appended claims are intended to be embraced therein.

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